

New species of *Calyptrophora* (Coelenterata: Octocorallia: Primnoidae) from the western part of the Atlantic Ocean

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Abstract.—Three new species of the gorgonacean genus *Calyptrophora* from the western Atlantic are described and compared with the previously known *C. trilepis* (Pourtalès, 1868). All are illustrated by scanning electron micrographs. The status of several Indo-Pacific specimens indentified in the literature as the type species, *C. japonica* Gray, 1866, is discussed, and a new drawing of Gray's specimen is provided.

Kinoshita (1908:58) early recognized the sharp distinction of the species of *Calyptrophora* having ringlike body sclerites as in *C. japonica* Gray, 1866, from those having unfused pairs of sclerites surrounding the polyps as in *C. kerberti* Versluys, 1906. He proposed for the latter group the subgenus *Paracalyptrophora*, including *C. mariae* Versluys, *C. josephinae* Lindström, 1877, and *C. kerberti* Versluys, 1906, and at the same time the nominate subgenus *Calyptrophora* s.s. for *C. japonica* Gray, 1866, *C. wyvillei* Wright, 1885, and *C. agassizii* Studer, 1894. Although subsequently ignored by other specialists, the validity of *Paracalyptrophora* can hardly be doubted. Recent discoveries not only support it, but even justify its elevation to full generic rank (Bayer 1981:937, Bayer & Stefani 1988:455).

Until now, ten species of *Calyptrophora* with abaxial body scales inseparably fused to form rings have been described: *C. japonica* Gray, 1866, *C. trilepis* (Portalès, 1868), *C. angularis* (Nutting, 1908), *C. clarki* Bayer, 1951, *C. juliae* Bayer, 1952, *C. spinosa* Pasternak, 1984, and *C. microdentata* Pasternak, 1985, with polyps bending upward, and *C. wyvillei* Wright, 1885, *C. agassizii* Studer, 1894, and *C. versluysi* Nutting, 1908, with polyps bending downward. All of these species inhabit the Indo-Pacific as far east as Hawaii except for *C. trilepis* (Straits of Florida),

C. microdentata (Rockaway Seamount, North Atlantic) and *C. agassizii* (Galápagos). Recent operations of oceanographic research vessels in the northwestern Atlantic have obtained three species with solidly fused rings in addition to *C. trilepis* and *C. microdentata*.

Differences in branching pattern, development of marginal spines of the sclerite rings, form of the opercular scales, number of polyps per whorl and spacing of whorls along the branches have resulted in the recognition of distinct but obviously related species. These suggest the existence of at least two lineages of *Calyptrophora* with fused rings: one with polyps facing upward as in *C. japonica*, the other with polyps facing downward as in *C. wyvillei*. The former, here treated as a "*japonica*-complex," contains two species groups, one with polyps having a pair of marginal spines on the basal ring and smaller spines, denticles or pointed lobes on the free margin of the buccal ring as in *C. japonica*, the other with polyps having at most a pair of short marginal points or lobes, and little or no ornamentation on the much narrower free margin of the buccal ring as in *C. trilepis*.

Family Primnoidae

Calyptrophora Gray, 1866

Calyptrophora Gray, 1866:25, fig. 1; 1870:42, fig. 13.—Studer [& Wright], 1887:

48.—Wright & Studer, 1889:xlvi, 50.—Versluys, 1906:104 (part).—Kinoshita, 1908:54.—Kükenthal, 1919:468 (part); 1924:317 (part).—Deichmann, 1936:171 (part).—Bayer, 1951:40 (part); 1956:F221 (part); 1981:937 (in key only).—Bayer & Stefani, 1989:455 (in key only).

Type species.—*Calyptrophora japonica* Gray, 1866, by monotypy. As this species is central to the understanding of *Calyptrophora* worldwide, a new drawing of Gray's type specimen is provided and some descriptive remarks about other similar material are included with the following descriptions of western Atlantic species.

Diagnosis.—Primnoidae with verticillate polyps enclosed in two annular sclerite rings each composed of two inseparably fused abaxial scales. Tentacles of most species with small curved scales.

Descriptions.—Colonies are planar or nearly so, the branching dichotomous, bipectinate or lyrate, in one species in whorls from the main stem but subsequently dichotomous, in a few species unbranched and flagelliform, with polyps always arranged in whorls and in most species directed upward.

The polyps are encased in two ring-like sclerites, each composed of two semiannular sclerites inseparably fused abaxially and adaxially to form solid rings surrounding the body; in most species a pair of curved infrabasal scales lies between the basal ring and the sclerites of the coenenchyme, but in a few the basal ring articulates directly with the coenenchymal plates. Eight roughly triangular scales close the aperture of the distal body ring, forming an operculum covering the retracted tentacles; in some species, the tentacles have numerous small, narrow, curved scales. The coenenchyme contains a layer of tessellate or imbricating plates. In this material from the western Atlantic, sclerites are composed of magnesian calcite containing from 6.4 mole% to 8.1 mole% $MgCO_3$ as determined by X-ray diffraction.

The axis is stiff, brittle, heavily calcified with aragonite, weakly grooved longitudinally, proximally brownish or blackish, becoming paler distally, sometimes with bronze or golden metallic sheen; the holdfast also is composed of aragonite, irregularly discoidal, attached to solid substrate, only rarely obtained owing to its firm attachment to solid substrate.

Distribution.—Indian Ocean; Pacific Ocean from the Malay Archipelago to the Galápagos and the Gulf of Panama; Atlantic Ocean. In depths of 228–1463 m.

Calyptrophora trilepis (Pourtalès, 1868)
Figs. 1, 2b

Primnoa trilepis Portalès, 1868:130.

Calyptrophora trilepis.—Gray, 1870:42.—Lindström, 1877:7.—Deichmann, 1936:171, pl. 25, fig. 1, pl. 26, fig. 4.

Stachyodes trilepis.—Versluys, 1906:122.—Kükenthal, 1919:465; 1924:316.

Not *Stachyodes trilepis.*—Studer, 1901:41, pl. 5, pl. 11, figs. 3, 6, 7 (= *Stachyodes bellissima* Kükenthal, 1915).

Material examined.—Blake Plateau, off Savannah, Georgia: 31°49'40"N, 78°19'16"W, 625 m, R/V *Cape Hatteras* cruise SA-6, dredge 5, 7 May 1987, one incomplete colony, USNM 79764.

Blake Plateau, off Brunswick, Georgia: 31°07'N, 79°08.5'W, 631 m, R/V *Gosnold* cruise 74, sta. 2478, 17 Sep 1965, one colony lacking holdfast, and fragments, USNM 57300.

Blake Plateau, off Brunswick, Georgia: 31°01.5'N, 78°19'W, 911 m, R/V *Gosnold* cruise 74, sta. 2382, 27 Aug 1965, one colony lacking holdfast, USNM 57299.

Blake Plateau, off Brunswick, Georgia: 30°59'N, 78°14'W, 480 fathoms (=878 m), R/V *Atlantis* sta. 266–41, 15 Jul 1961, three colonies without holdfast, USNM 57446.

Blake Plateau, off Fernandina, Florida: 30°57.2'N, 78°54.6'W, 779 m, R/V *Gosnold* cruise 74 sta. 2385, 27 Aug 1965, one colony lacking holdfast, USNM 56893.

Blake Plateau, off Fernandina, Florida:

30°53'N, 78°47'W, 445 fathoms (=814 m), R/V *Atlantis* sta. 266-40, 13 Jul 1961, three colonies one lacking holdfast, and fragments, USNM 57445.

Straits of Florida off Sebastian Inlet, Florida: 27°57'N, 78°56'W, 779 m, R/V *Gerda* sta. G-181, 2 Jul 1963, one colony 17 cm tall and one small colony 7 cm tall, both lacking holdfast, USNM 52744 (SEM 70, 245).

Straits of Florida "off Bahia Honda," Florida, [24°14'20"N, 80°59'40"W, 324 fathoms (=593 m), U.S. Coast Survey Exploration of the Gulf Stream, U.S. Coast Survey steamer *Bibb*, 12th dredging, Pourtalès sta. 22P, 4 May 1868], dry fragment, holotype, MCZ 4812.

Diagnosis.—Dichotomously branched, lyrate *Calyptrophora* with polyps about 1.5 mm tall, directed upward, in whorls of 3-4, 13-17 whorls in 3 cm of axial length; infrabasal scales well developed; basal ring with a pair of inconspicuous blunt, short marginal processes; free margin of buccal ring narrow, smooth; outer surface of annuliform sclerites ornamented by crowded, smooth granules, interior with crowded complex tubercles.

Description.—Colonies are lyrate, dichotomously branched in one plane, attached to solid substrates by a roughly discoidal holdfast; terminal branches are long and very flexible. The polyps are in regular whorls of 3 or 4, sometimes in opposite pairs, predominantly directed upward but with occasional strays facing down; 13-17 whorls occur in 3 cm, but commonly 15.

The polyps are protected by 2 ringlike sclerites each composed of two inseparably fused semicircular scales, a pair of large, crescentic infrabasal scales situated between the basal ring and the coenenchymal scales, and the usual 8 triangular operculars; sometimes the members of the basal ring fail to meet adaxially, but the abaxial symphysis is always solidly fused. The tentacles have numerous small, narrow scales curved in conformity with their locations. The outer surface of the annular body scler-

ites is covered with sharp, simple granules, and the inner surface with crowded, complex tubercles. The opercular scales have a longitudinal apical keel on the inner surface, most strongly developed on the abaxials, becoming less prominent toward the axis.

The axis is dark brown with bronze lustre proximally, gradually becoming paler with a golden gloss distad, and almost white near the twig tips; inconspicuous longitudinal ribbing is present on the proximal parts of the axis, becoming obsolete distad. The terminal twigs are unusually flexible, especially in small specimens.

The sclerites are composed of magnesian calcite; USNM 52744 was found to have 6.6 mole% MgCO₃, USNM 57445 with 7.4 mole% MgCO₃. The mineral component of axis and holdfast consists of aragonite.

Distribution.—Blake Plateau south to Straits of Florida between the Florida Keys and Cuba, 593-911 m.

Comparisons.—*Calyptrophora trilepis*, with its inconspicuous marginal processes of the basal ring and smooth margin of the buccal ring, resembles the Hawaiian *C. angularis* (Nutting). Its body sclerites are more strongly sculptured and much less fragile than those of *C. angularis*, which are nearly smooth and very easily damaged. *C. trilepis* is branched dichotomously, whereas *C. angularis* is bipectinate.

Remarks.—The sole surviving fragment of the type specimen in the Museum of Comparative Zoology was kindly made available by the late Dr. Deichmann for preparation of the drawing presented here.

Deichmann (1936:172) misquotes the original description by Pourtalès (1868:130) by adding the words "downward bent," which are not in the published text. Examination of a part of the original specimen shows that the polyps are directed upward, not downward, and have two, not three, ringlike scales. However, Pourtalès obviously overlooked the fact that the members of the infrabasal pair of scales are not inseparably fused to form a ring as the

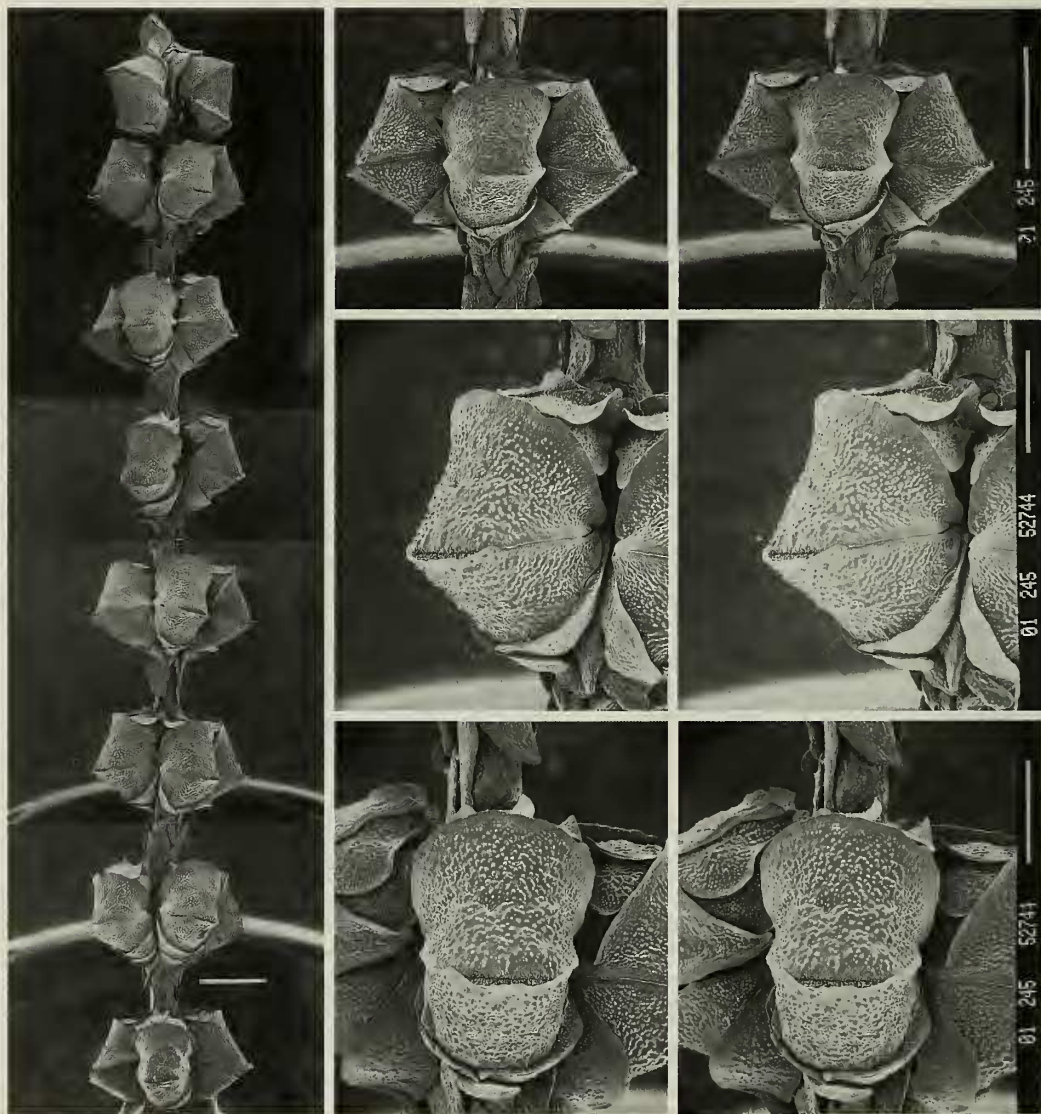


Fig. 1. *Calyptrophora trilepis* (Pourtalès), USNM 52744 (SEM 245). Left. Part of terminal branch with whorls of polyps (scale bar = 1.0 mm); Right. Single whorl of polyps, stereo pair (scale bar = 1.0 mm); oblique and abaxial aspects of polyp, stereo pairs (scale bar = 0.5 mm).

basal and buccal pairs are, so the polyps have two, not three ringlike scales; the alleged downward orientation of the polyps is an error introduced by Deichmann and represented by her illustrations (1936: pl. 25, fig. 1, pl. 26, fig. 1). Verrill's original unpublished illustration intended for his projected "Blake Report" shows the correct upward orientation of polyps.

Calyptrophora pillsburyae, new species
Fig. 3

Material examined.—Leeward Islands, Lesser Antilles, west of Montserrat: 16°55'N, 62°43'W, 686–1125 m, R/V *Pillsbury* sta. P-954, 18 Jul 1969, one incomplete colony, holotype, USNM 52743 (SEM 247, 1699).

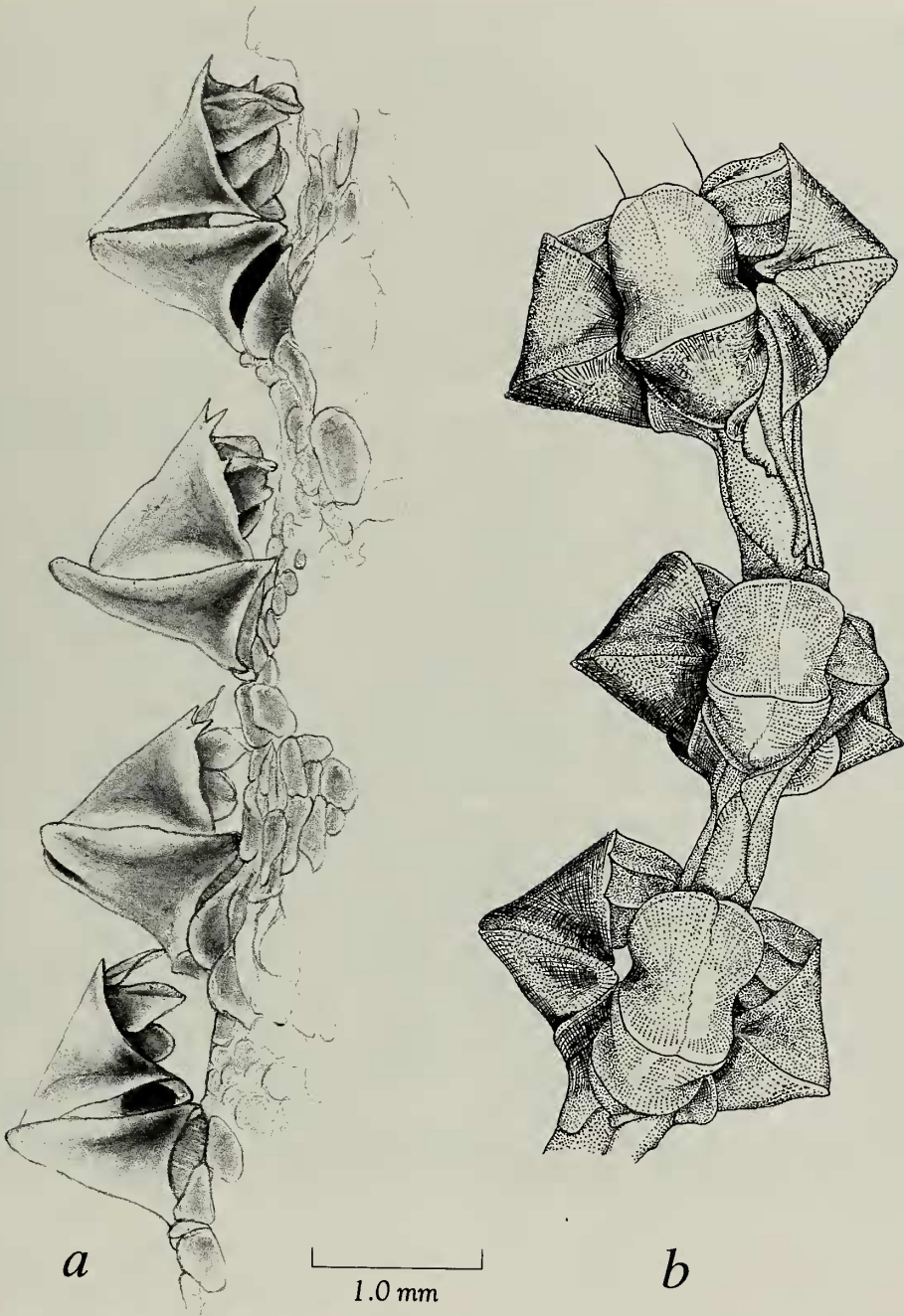


Fig. 2 a, *Calyptrophora japonica* Gray, holotype, BMNH 1866.1.8.2. b, *Calyptrophora trilepis* (Portalès), holotype, MCZ 4812. Scale bar applies to both drawings.

Diagnosis.—Dichotomous *Calyptrophora* with polyps about 1.5 mm tall, directed upward in whorls of 4, 11–12 whorls in 3 cm of axial length; infrabasal scales well

developed; basal ring having a pair of smooth, sharp marginal spines; buccal ring with narrow free margin having 4–6 conspicuous marginal denticles; outer surface

of annuliform sclerites ornamented by crowded, smooth granules.

Description.—The colony is narrow, upright, about 32 cm tall, branched dichotomously in one plane, 25–85 mm between bifurcations, with almost straight terminal branches up to 12 cm long. The polyps are directed upward, placed in regular whorls of 4 except on the lower parts of the proximal branches where there may be 5; 11–12 whorls occur in 3 cm. Whether this specimen represents a colony complete save for holdfast, or only a branch from a larger, openly lyrate colony, is not known.

The polyps are enclosed in two ringlike sclerites consisting of the solidly fused basal and buccal pairs of scales. A pair of conspicuous, crescent-shaped infrabasal scales is present between the scales of the coenenchyme and the basal sclerite ring, which bears a pair of short, smooth, sharp marginal spines. The annuliform solidly fused buccal scale pair has only a narrow free margin that does not hide the opercular scales from abaxial view; the buccal margin has 4–6 small but distinct smooth spines and sometimes one or more inconspicuous intermediate points. The opercular scales are roughly triangular with rounded angles, decreasing in size from the abaxials to the adaxials. They have a strong apical keel on the inner surface and corresponding though on the outer; the keel is marked by closely placed, narrow serrate ridges. The tentacles contain narrow, flattened scales with granular sculpture and tapered ends, placed crosswise and curved to fit their location in the tentacle. The coenenchyme contains a layer of elongate scales with rounded ends and somewhat overlapping margins.

The sclerites are composed of magnesian calcite containing 6.5 mole% $MgCO_3$. The axis is strongly mineralised with aragonite.

Etymology.—Named in honor of R/V *John Elliott Pillsbury*, research vessel of the University of Miami, in recognition of the rich contributions to knowledge of the American deep-sea fauna made possible by operations conducted aboard that ship.

Comparisons.—This species differs from both *Calyptrophora gerdae* and *C. antilla* by its smooth, rather short basal spines, and the small, well-differentiated, smooth spines of the buccal margin. The polyps of *C. pillsburyae* bear a striking resemblance to those of the type specimen of *Calyptrophora japonica* Gray from Japan in the Natural History Museum, London, Register number 1866.1.8.2. In 3 cm of axial length it has 16 whorls of 6 polyps; on the largest part of the branch, the whorls are composed of 8–11 polyps.

My observations and drawings of Gray's specimen differ somewhat from those of Versluys (1906:113, figs. 153–155) made prior to 1906. My drawing (Fig. 2a), made with the aid of a camera lucida, does not show the basal spines as long as drawn by Versluys (1906: figs. 153, 154), apparently free-hand, and I did not find basal spines as long as shown in his figure 153.

To judge by Versluys' excellent drawings of the specimens that he considered to be variants of *C. japonica*, all probably belong to other species. They differ among themselves in much the same way as do *C. gerdae*, *pillsburyae*, and *antilla*, which I cannot regard as representing a single variable species. Versluys's specimen no. 3 of "Form B" seems to be very close to Nutting's (1908:578) *Calyptrophora japonica* from *Albatross* sta. 4007 off Ukula (=Puolo) point, Kauai, Hawaii, which subsequently was described as a distinct species, *C. clarki* (Bayer, 1951:40).

The specimens from Hawaii and Japan identified as *C. japonica* by Nutting (1908, 1912) are of biplanar, bipectinate growth form. The type specimen of *japonica* is dichotomous (see Gray 1866, fig. 1 and 1870, fig. 13) but, as it is incomplete, it is impossible to determine whether it is only a dichotomous distal branch of a uniplanar bipectinate colony such as Versluys's specimen no. 2, shown on his plate 10, fig. 27, of a biplanar bipectinate colony such as Kinoshita (1908,

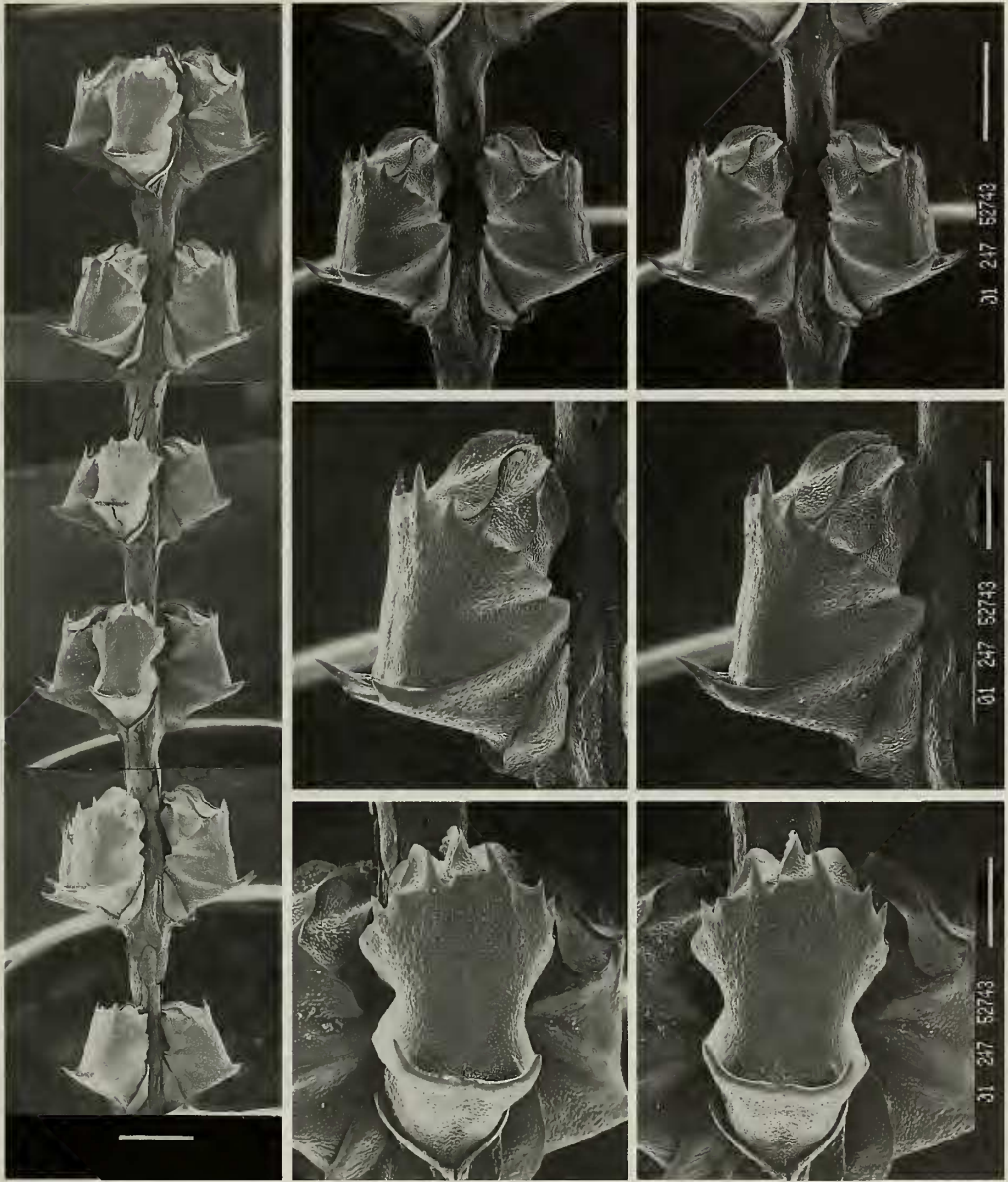


Fig. 3. *Calyptrophora pillsburyae*, new species, USNM 52743, holotype (SEM 247). Left. Part of terminal branch with whorls of polyps (scale bar = 1.0 mm); Right. Single whorl of polyps, stereo pair (scale bar = 1.0 mm); Lateral and abaxial aspects of polyp, stereo pairs (scale bar = 0.5 mm).

plate 4, fig. 33) illustrated, or part of a regularly dichotomous colony.

Nuttings's specimen from *Albatross* sta. 4924 off Nagada Saki (USNM 30027) has polyps corresponding closely with those of Gray's type and is therefore deemed to be genuine *japonica*. The col-

ony is severely damaged, but retains ample evidence of biplanar bipectinate growth form. A biplanar bipectinate colony taken in 1900 at *Albatross* sta. 3749 off Suno Saki, identified as *C. japonica* (USNM 49323) by Nutting but not included in his report on the material from

the 1906 cruise, has polyps agreeing closely with Versluys's specimen no. 10 of his Form C, which he thought might represent a new species distinct from *japonica* (1906:122). Biplanar bipectinate colonies from *Albatross* sta. 3882 between Maui and Molokai, reported as *japonica* by Nutting (1908:578), have polyps of the *gerdae* type, with irregular, broad, more or less pointed lobes on the free margin of the buccal ring.

A few specimens taken by the *Albatross* in Philippine waters with the general features of the "japonica complex" conform well neither with Gray's type specimen nor with Versluys's Forms B and C. One of the *Albatross* specimens established as a distinct species, *C. juliae* Bayer (1952:82) (incorrectly synonymized with *C. japonica* by Pasternak (1984), is now presumed to have an unbranched growth form similar to flagelliform specimens from New Caledonia in the Muséum National d'Histoire Naturelle in Paris, which remain to be described.

Pasternak (1985:30) described a new species, *Calyptrophora microdentata*, from south of Rockaway Seamount in 940–950 m (30°30.5'N, 52°00.5'W), which differs from *C. pillsburyae* in the paired arrangement of polyps, which were reported to be 1.7–2.0 mm long. Being larger than the polyps of *C. pillsburyae*, they must be more closely placed along the axis than is the case with *C. pillsburyae*. The margin of the buccal ring of *C. microdentata* was reported to have 4 broad, acute projections which sometimes are needle-like, occasionally with smaller intermediate spines resulting in a dentate appearance. Pasternak commented on the resemblance of *C. microdentata* to *C. japonica*, a comparison that applies also to *C. pillsburyae* as mentioned above.

In view of the small size and probable immaturity of the unique specimen of *C. microdentata*, and the single but well developed specimen of *C. pillsburyae* now available, it cannot be ruled out that further analysis may demonstrate that the two are

conspecific when additional specimens of both become available for study.

Calyptrophora antilla, new species
Fig. 4

Material examined—Windward Passage between Cuba and Haiti: 20°09'N, 73°29'W, 1399 m, R/V *Pillsbury* sta. P-1146, 14 Jan 1970, severely damaged syntypic fragments, USNM 52914 (SEM 1697, 1698, 1740).

Diagnosis.—Dichotomous *Calyptrophora* with polyps about 2 mm tall, directed upward in whorls 4 or more, 7–11 whorls in 3 cm of axial length; infrabasal scales well developed; basal ring with a pair of prominent, sharp, serrated marginal spines; free margin of buccal ring narrow, with 4 conspicuous marginal spines and sometimes two or more small intermediate spinules; outer surface of annuliform sclerites ornamented by sharp granules arranged in rows radiating away from depositional centers.

Description.—The severely damaged specimen is broken in many pieces, the largest of which is dichotomously branched in one plane, showing that the colony is lyriform, with internodes 2–3 cm long and nearly straight terminal branches that may exceed 6 cm in length. The polyps are about 2 mm tall, directed upward and arranged in regular whorls of 4 (but more on the large branches), of which 7–11 occupy 3 cm of axial length. The axis is stiff and brittle, nearly circular in cross section, the basal parts with inconspicuous irregular longitudinal grooves; it is brownish in color with distinct metallic bronze luster, darker proximally and becoming paler distad until in the slenderest terminal branches it is smooth, cream white with pearly reflections.

The polyps are encircled by two annular sclerites each composed of two curved scales inseparably fused along the abaxial midline and at the narrow adaxial symphysis. A pair of semilunate infrabasal scales

lies between the coenenchyme and the basal ring. The basal ring bears a pair of strong, serrate, slightly curved marginal spines. The buccal ring has only a narrow free margin, with four slender, sharp marginal spines, and sometimes two or more smaller spinules. The closed operculum projects prominently from the buccal aperture, composed of 8 tall, bluntly triangular scales with a strong apical keel on the inner surface corresponding with an external furrow. The outer surface of the annular sclerites is ornamented by sharp granules arranged in lines radiating out from the depositional center of the component scales, extending as sharp, serrated ridges along the marginal spines. The tentacles contain many small, flattened, oval scales with granular sculpture. The coenenchyme contains a layer of thin, flat, irregularly oval scales ornamented externally by simple granules, internally by complex tubercles.

The sclerites are composed of magnesian calcite containing 6.4 mole% $MgCO_3$. The axis is heavily mineralized with aragonite.

Etymology.—*Antilla*, noun in apposition, referring to the Antilles, islands surrounding the Caribbean Sea.

Comparisons.—*Calyptrophora antilla* differs from *C. gerdae* in having short, serrate spines on the narrow free margin of the buccal ring, and much longer serrate spines on the basal ring; it differs from *C. pillsburyae* in having the spines of both basal and buccal rings distinctly serrate rather than smooth.

Calyptrophora gerdae, new species

Figs. 5, 6

Material examined.—Straits of Florida off Jupiter Inlet, Florida: 27°01'N, 79°21.5'W, 275–229 m, R/V *Gerda* sta. G-169, 29 Jun 1963, one immature colony with three branches, lacking holdfast, USNM 52740, paratype.

Straits of Florida off Southwest Point, Grand Bahama: 26°27'N, 78°40'W, 514–556 m, R/V *Gerda* sta. G-707, 22 Jul 1965,

one colony lacking holdfast, USNM 52741, paratype (SEM 1717).

Straits of Florida off Memory Rock, Little Bahama Bank: 26°52'N, 79°11'W, 536 m, R/V *Gerda* sta. G-1314, 31 Mar 1971, one colony lacking holdfast, USNM 52742, holotype (SEM 246); two colonies lacking holdfast, USNM 100744, paratypes.

Diagnosis.—Dichotomous *Calyptrophora* with polyps about 1.5 mm tall, directed upward in whorls of 4–6, 16–20 whorls in 3 cm of axial length; infrabasal scales well developed; basal ring having a pair of prominent, broad, flattened, serrate marginal spines; buccal ring with free margin wide, divided into several irregular, more or less pointed, broad lobes; outer surface of annuliform sclerites ornamented by fine, closely crowded smooth granules arranged in radial rows diverging from depositional centers.

Description.—The colonies are dichotomously branched in one plane and apparently do not attain large size as the largest is only approximately 14 cm high and wide; in the proximal parts of the colonies the axis is the color of pale bronze with distinct metallic luster, marked by fine, irregularly longitudinal ridges and grooves, distally becoming smooth, paler, with golden metallic iridescence. The polyps are about 1.5 mm tall, directed upward and arranged in regular whorls of 5–6, except near the tips of branches where 4 is a common number; 16–20 whorls occur in 3 cm of axial length.

The polyps have a pair of crescent-shaped infrabasal scales between the coenenchymal plates and the basal pair of body scales; the basal scales form a solid ring bearing a pair of strong, echinulate marginal spines. The scales of the buccal pair are also inseparably fused to form a ring the wide free margin of which extends beyond the abaxial opercular scales, nearly or completely obscuring them from abaxial view. The buccal margin is divided into two or more broad lobes, sometimes more or less pointed, sometimes smoothly rounded. The opercular scales are broadly triangular in

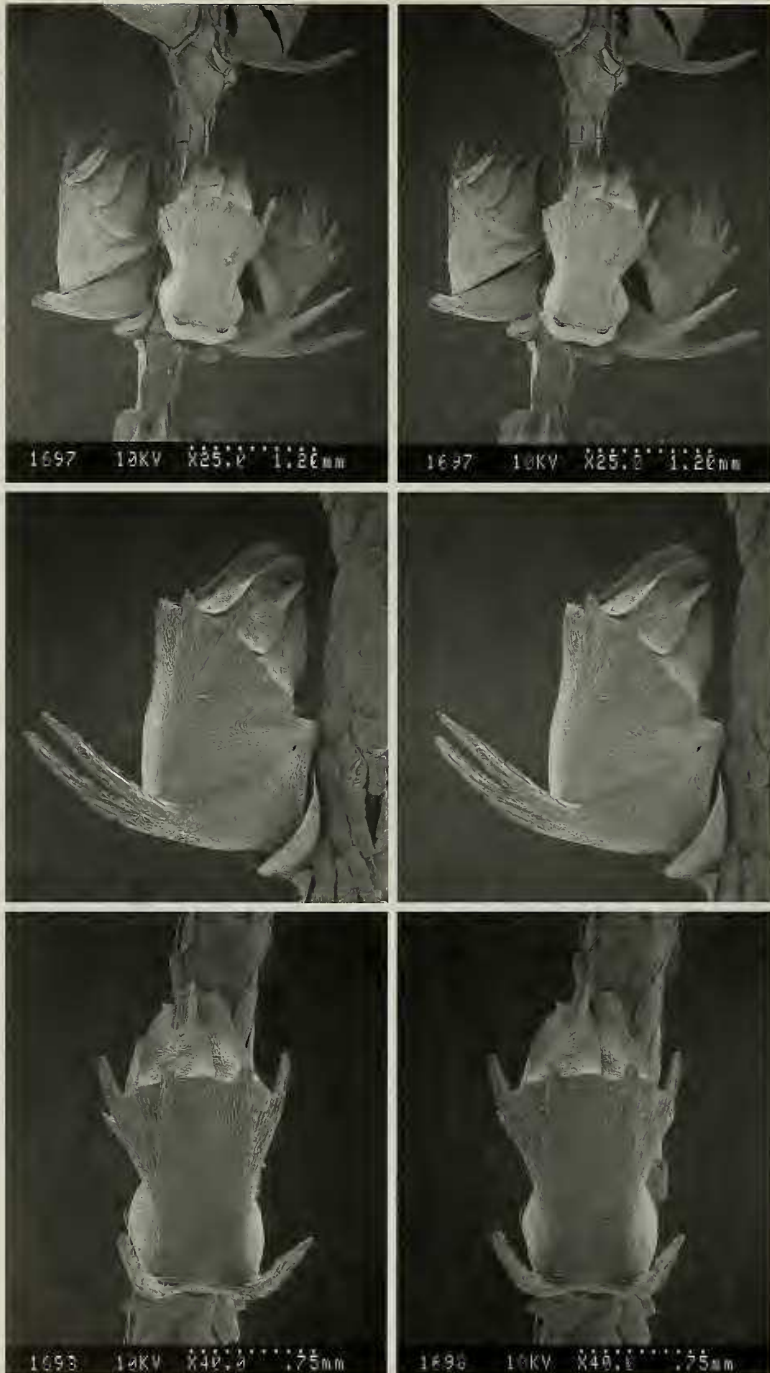


Fig. 4. *Calyptrophora antilla*, new species, USNM 52914, syntypic fragments. Top. Single whorl of polyps, stereo pair (SEM 1697); Bottom. Lateral and abaxial aspect of polyp, stereo pairs (SEM 1698). Magnifications as indicated by scales.

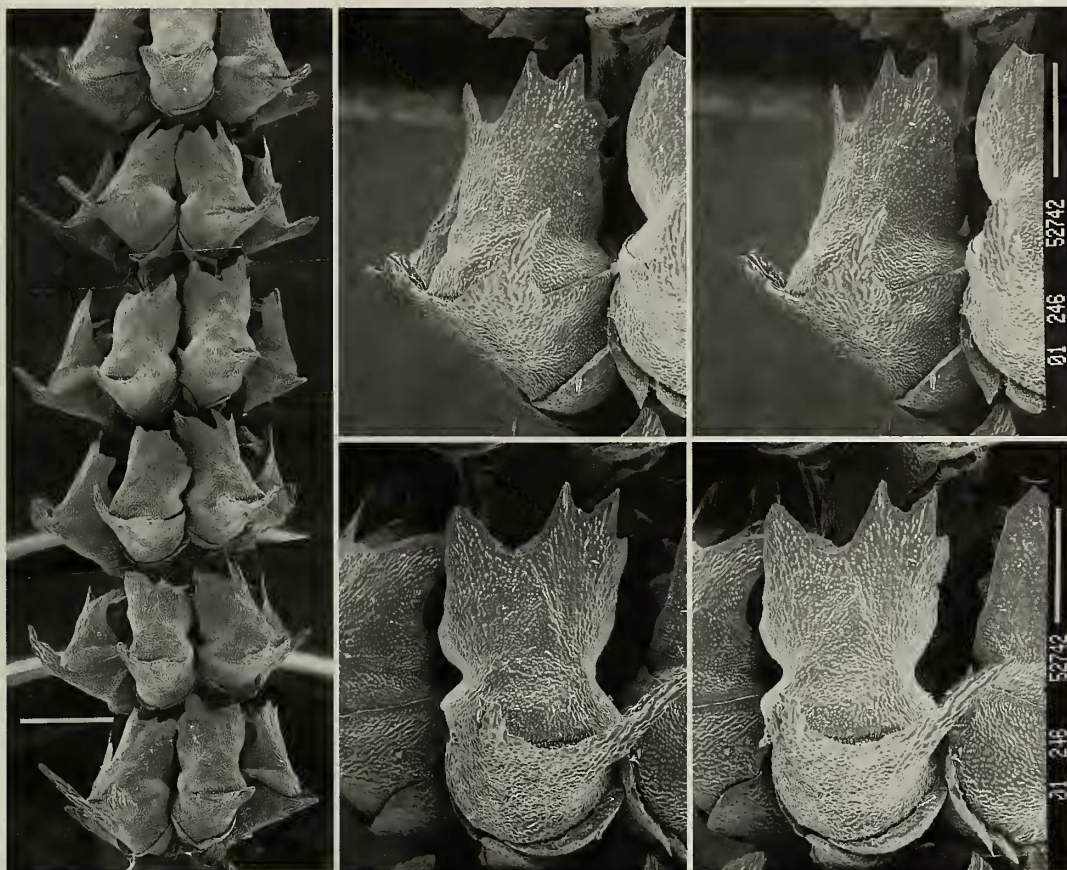


Fig. 5. *Calyptrophora gerdae*, new species, USNM 52742, holotype (SEM 246). Left. Part of terminal branch with whorls of polyps (scale bar = 1.0 mm); Right. Oblique and lateral aspects of polyp, stereo pairs (scale bar = 0.5 mm).

shape, with rounded angles and a strong apical keel on the inner surface. The operculars decrease in size from the abaxials to the adaxials; the keel of the abaxial scales has two or more narrower longitudinal crests, and the apex of the largest abaxial may be conspicuously bilobed. The outer surface of the body rings and operculars is covered with small, simple granules, and the inner surface with complex tubercles; the marginal spines of the basal ring have several narrow, serrate longitudinal ridges. The tentacles contain small, narrow, flattened, tuberculate scales with rounded ends, placed crosswise and curved to fit the contour of the rachis. The coenenchyme con-

tains a layer of polygonal plates of very variable shape.

Sclerites are composed of magnesian calcite containing 8.1 mole% $MgCO_3$. The axis is heavily mineralized with aragonite.

Etymology.—Named for R/V *Gerda*, for years the workhorse vessel of the Marine Laboratory, University of Miami.

Comparisons.—This species differs from *C. pillsburyae* in having serrate rather than smooth basal spines, wide buccal margins with broad, flat marginal lobes rather than narrow buccal margins with small, smooth spines, and strong, longitudinally crested apical keels on the abaxial operculars. *C. antilla* differs in having a narrow buccal

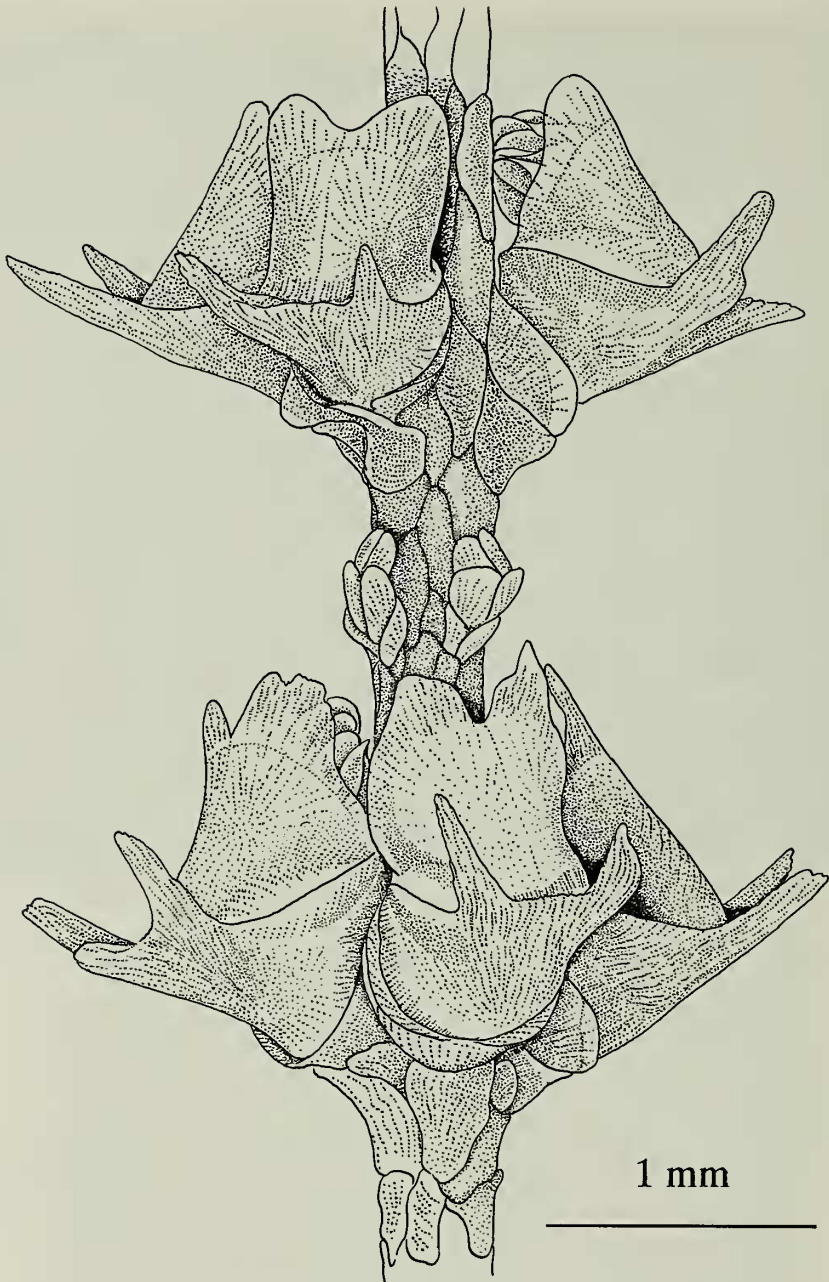


Fig. 6. *Calyptrophora gerdae*, new species, USNM 52742, holotype. Whorl of new polyps between fully developed whorls. Camera lucida drawing.

margin with four strong, serrate spines, and very long, serrate basal spines.

The polyps of a specimen of *Calyptrophora* from Hawaii identified as *C. japonica* Gray by Nutting (1908:578; USNM

25369) are extraordinarily similar to those of *C. gerdae*, differing most conspicuously in having smooth rather than granulate body scales. Moreover, the large fragments of Hawaiian material show conclusively

that the colonies are stiffly bipectinate rather than regularly dichotomous as in *C. gerdae*.

Remarks.—The small size of specimens of *Calyptrophora gerdae* collected at three different localities over a period of nine years suggests that the species may not produce colonies as large as do other species of the genus.

Whorls of new polyps are present here and there between whorls of fully developed individuals. On the specimen from off Grand Bahama (USNM 52741) they occur in two cases between the second and third whorls of a bifurcation on one half of the dichotomy; in another case the new polyps occur between fully developed whorls on part of a terminal branch removed for illustration. The body scales of the young polyps are arranged in three unfused pairs, suggesting that the infrabasal scales of fully developed polyps are polyp scales rather than coenenchymal scales, and demonstrating that the inseparable ringlike fusion of basal and buccal scale pairs is a function of age. As no examples of young polyps were found on a preparation made for examination by SEM (No. 246), the drawing made prior to availability of scanning microscopy is presented here (Fig. 6) to illustrate this developmental phenomenon.

Key to the western Atlantic species of *Calyptrophora*

- 1. Basal body ring with two projecting spines 2
- 1. Basal body ring without projecting spines, or at most two short, blunt lobes; buccal ring with distal margin entire, not widely flared around operculum *trilepis* (Pourtalès)
- 2. Polyps arranged in pairs *microdentata* Pasternak
- 2. Polyps arranged in whorls of 3–6 or more 3
- 3. Spines of basal ring smooth; buccal ring with only a narrow free margin not widely extending beyond bases of opercular scales, with six or more small smooth, sharp spines . . . *pillsburyae*, new species.

- 3. Spines of basal ring serrate 4
- 4. Buccal ring with a wide free margin extending beyond bases of opercular scales and produced into two broad, more or less pointed lobes, one or both of which may be divided in two; 16–17 whorls in 3 cm of axis *gerdae*, new species.
- 4. Buccal ring with a narrow free margin extending little beyond bases of opercular scales, with four strong, well differentiated, echinulate spines; 11–12 whorls in 3 cm of axis *antilla*, new species.

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